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EDITORIAL COMMENT

Support is one of those intangible things that we all expect to get when we buy software or hardware. It comes in varying degrees with eveything we purchase, from no support to very excellent support. CN80 tries with its limited resources, and staff to give full support to not only the computers that we write about, but also to the software we sell. There are times however that our response may seem to be very slow. This is due to the sheer volume of mail we receive, and many times because the support may take several hours to research. But we do try to answer all the questions we receive.

We also ask your help, if you read of a problem in the Open Forum and have the answer, or know where to find the answer, please send it to us so that we may publish your answer in the Open Forum. Many times the problems one person is having is the same problem that others are having, or will have. By placing the answer in the Open Forum, many users benefit. Going directly to one person with the answer, only helps one person, when your answer could be a boon to others.

When you send material to be published, please place it on a disk in ASCII format, no matter how small or short it is. Write your name and DOS used on the disk label. This eliminates our having to type your information over, and eliminates the possibility of errors creeping in. Also please indicate if you want us to publish your full name and address. Without your express permission to do so, our policy is to only publish a reference of your initials and location. This is done to protect your privacy. We do forward all replies to the individual who's letter or question appears in the Open Forum.

NEWS ITEMS

TANDY CLOSES COMPUTER CENTERS

Tandy has closed nearly 200 Computer Centers across the country. Finally realizing that they are unprofitable. Most of the stores will revert back to plain Radio Shack Stores, some will stay closed forever and others will be turned into what Tandy now is calling Computer City, which are to be superstores and will sell other brands as well as Tandy computers. One reason for this much belated move is that Tandy is trying to capture the large business market by putting their emphasis in the crew of outside salesmen who call on large business firms. Ed Juge, claimed that the outbound sales force had accounted for 90% of the Computer Centers Sales.

It is no surprise that large business buyers had never walked into a Radio Shack Computer Center to purchase computers for his corporation. With the exception of a few dedicated persons, most of the salespeople who manned these stores knew as much about their products as the customer did. We wonder if the same will be true of the Tandy superstores. But you might be able to walk into a superstore and pick up a SuperDuper 100% IBM/Apple Clone in the future. Maybe this move on their part also helps to explain their dropping the TRS-80 line and the consumer who purchased them. Since Tandy does manufacture units for other computer companies under different labels, we wonder who will support these computers? Tandy if it has their name on it, or the company who's name tag is attached, even if it is manufactured in a Tandy plant and sold in a Tandy superstore. Hardware and even software without support, is asking for hours and hours of trying to find someone who knows something about it, after you have made the purchase.

Tandy said if the six new superstores that they have opened are successful, then they will open superstores across the country. Radio Shack like Apple tried everything possible to lock in customers with the TRS-80 line, forcing them in many cases to buy only their line of accessories and peripherals. Have they learned that they can not lock in users? Apple may have learned the same lesson as evidenced by their recent agreements with IBM to merge Apple and IBM operating platforms. Will this be the true age of standardization? Meanwhile we will stick to our TRS-80s, while waiting to see if the computer industry is selling us another bunch of "throw-aways-buy-the-new-one" computers.

HOWE SOFTWARE IS NOW AVAILABLE FROM CN80

Computer News 80 has signed an agreement with Hubert Howe for the exclusive distribution of the software provided by Howe Software.

The software which has been sold by Howe Software for many years, and which has stood the test of time as quality products, includes a system diagnostic package, a word processor, bookkeeping and accounting packages for the home or business. Most packages are available in both Model I, III and 4 versions, and some MS-DOS. Many at reduced prices for CN80 subscribers.

SYSTEM DIAGNOSTICS

Since all the other system diagnostic publishers have withdrawn their products from the market. CN80 is proud to be able to bring the the Howe diagnostic package to our readers. (This package was reviewed in Vol. 1 No. 7, July 1988 of CN80) in which the reviewer wrote "I hope you are lucky enough not to need a program like this, but then again, knowing all is well with your computer gives you peace of mind!" The program will check memory, keyboard, video, and drives both single and double-sided, and up to 80 tracks on all drives. It will also check your RS232 interface.

(For more details see the ad in the TRS-80 Shoppers Guide).

AEROCOMP

Sometime near the first of July it appears that Aerocomp has closed, since all the phones were disconnected. As of this printing we have no other information concerning their closing.

PROGRAMMING TUTOR Part 31

by Chris Fara (Microdex Corp)

DEBUG + DUMP

Dump! Don't you love those crafty computer words? We "boot" the computer even though it doesn't have any legs (the verb is supposed to conjure a picture of DOS being pulled by its electronic "bootstraps" from disk into the computer's memory). We wallow in "bugs", put "garbage in" and get "garbage out", DUMP that garbage to the screen, printer, files, and who knows where else, PURGE or even KILL without any qualms, and routinely practice witchcraft by putting "hex" on all kinds of things. Makes you wonder what the long-term effect on our morals will be.

Meanwhile... last month we saw that memory contents can be easily modified with DEBUG by sticking some bytes into any location. Since a "machine program" is simply a sequence of bytes understood by the computer as "instructions", it is possible to create such programs with DEBUG, without an "assembler" (again, even novices can try it: it's a good confidence builder).

As an example let's make a variation on the PRINT/CMD program listed some time ago in CN80. It was a quick and dirty utility to print one line notes directly from the keyboard. For example:

```
  PRINT July 4, 1991
```

would print the date, or whatever was typed after PRINT. Upon execution of any CMD-program the entire command line (including the terminating "enter") gets stored in a memory area called "command buffer", and the register pair HL "points" to the first non-blank character in the "command tail": in the above example the letter "J". PRINT uses HL to fetch characters from the "tail" and sends them to the printer. The listing in CN80 was awfully complicated and only for Mod-4, but a simpler scheme using direct output to the printer "port" 248 (F8'hex) works just as well on any TRS-80 computer.

In the following listing the right column is an assembly language "source code". On the left are the "machine code" bytes into which an assembler would translate the source code. Sorry, but since we're dealing with DEBUG, all numbers are in hex. The general idea is this: the first 4 lines check the INput from the printer port, and keep looping (JP) if not "ready". The next 3 lines pick a byte from command tail and OUTput it to the printer. The last 3 lines check if that byte was an "enter" (ASCII 0D'hex) and keep looping (JP) for more if not, or RETurn to DOS when all done.

```
DB F8           IN  A,(0F8H)
E6 F0           AND  0F0H
FE 30           CP  30H
C2 00 80        JP  NZ,8000H
7E              LD  A,(HL)
23              INC  HL
D3 F8           OUT  (0F8H),A
FE 0D           CP  0DH
C2 00 80        JP  NZ,8000H
C9              RET
```

Without an assembler the bytes in the left column can be figured out "manually" from any Z-80 reference table (eg. Z80 Tutor Vol.X). For example in an alpha cross-reference listing look for the "mnemonic":

```
  IN A,(n)
```

read the corresponding machine code:

```
  DB n
```

and replace the "n" with a hex number of the desired port. Notice that in the machine code 2-byte "operands" are always assembled in reversed order (eg. the "jump" address 8000'hex is assembled 00 80).

The next step is to put into memory that sequence of 19 program bytes:

```
  DB F8 E6 F0 FE 30 ..... etc.
```

Use exactly the same DEBUG procedure as described last month: get into the "modify mode" starting at address 8000'hex, type the 19 bytes, and press [enter] to exit from the modify mode. That's it. Exit from DEBUG, and in Mod-III LDOS and Mod-4 TRS/LS-DOS don't forget to turn the debugger OFF as noted last month. The bytes we have stored in memory are still there, in fact they'll sit there even if we reset the computer, until some other program overwrites that memory area or the power is turned off.

So the only remaining task is to "dump" our program into a CMD-file. The DOS command DUMP is used for that and it needs 3 addresses: START and END of the memory area to be dumped, and the so-called "TRAnsfer" (or "entry") address where the first executable instruction is located. In our case both start and "transfer" are the same: 8000'hex. The end address is where we stored the last byte (C9'hex). There are 19 bytes, so the first "paragraph" (row) of 16 bytes is full, and 3 more bytes sit in the second row which begins at 8010'hex. Therefore the address of the last byte is 8012'hex.

The DUMP command in Mod-III LDOS and Mod-4 TRS/LS-DOS looks like this (enter all in one line):

```
  DUMP PRINT/CMD (START=X'8000,
     END=X'8012,TRA=X'8000)
```

The words START, END and TRA may be abbreviated S, E and T. In TRSDOS 1.3 it's similar, except omit the X'doo-dads, and abbreviations are not allowed:

```
  DUMP PRINT/CMD (START=8000,
     END=8012,TRA=8000)
```

Congratulations! You have just created a real machine program without even touching an "editor" or "assembler" or anything except a couple of primitive built-in DOS utilities. To see that it's for real, enter from DOS, for example:

```
  PRINT I program in machine language!
```

and pin up the printed page where it can be admired by skeptics (including yourself).

Note that PRINT will loop forever if the printer never gets "ready" (reset computer if that happens). A check for [break] could be added to get out of an endless loop, but nobody really expects a quickie utility like this to be "elegant". Just make sure printer is on line before printing.

Whether created with the DUMP command or by an assembler, a CMD-file has a standard format. Make a hex printout of our file to see what's in there. From Mod-III LDOS and Mod-4 TRS/LS-DOS enter:

```
  LIST PRINT/CMD (H,P)
```

and from TRSDOS 1.3

```
  LIST PRINT/CMD (PRT)
```

In TRSDOS 1.3 the listing of hex bytes is arranged vertically, like this:

```
  0155 ... etc
  5002 ...
```

Read the first column as 05'hex, then 10, 50, 52, etc. In the other 2 DOSes the bytes are listed in the usual way from left to right as 2-digit hex numbers. The first byte is always 05'hex and tells DOS "here comes file header, skip it". It may be the program name, date, etc (it is created automatically by the DUMP command or the assembler). The second byte is the length of the header, ie. how many bytes DOS should skip.

Now skip that many bytes until you find 01'hex which is a standard code that tells DOS "here come program bytes to be loaded". After 01 there is a one-byte count of bytes to be loaded, with a twist: the count includes also the next two bytes which are the address where the program should be loaded. In our file we should see the following sequence:

```
  01 15 00 80 ...
```

The third and fourth byte are obviously our reversed address 8000'hex. The 15'hex is decimal 16+5=21. Since this includes the two address bytes, the actual number of bytes DOS will load is 19 which is exactly what we have dumped into the file.

Skip these 19 program bytes and find this sequence:

```
  02 02 00 80
```

The code 02-02 tells DOS "the next 2 bytes are the transfer address". In our case it is the reversed 8000'hex. The transfer address is always the last meaningful value in a CMD-file. After that there may be some "garbage", but DOS ignores it completely.

So when we enter from DOS the name of a CMD-file, the bytes stored in that file get loaded into memory and then DOS executes a call to the "transfer" address. The program essentially becomes a subroutine of DOS and that's why a simple RET at the end of a program can be used to return to DOS. In the case of a CMD-file "dumped" from memory the program normally gets loaded back into the same place from which it was dumped. An assembler is more flexible: with the ORG instruction we can determine where the program will be loaded.

Enough of these dumps. The point of all that was to get familiar with the relation between DEBUG and CMD-programs, in preparation for next month when we'll review program "debugging".

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A VISIT WITH DAVID GOBEN

by David Goben

SPECIAL HARD DISK INSTALLMENT (part I)

NEW HARD DISK

Among other things, I recently obtained another hard disk drive. When I bought the thing, the guy told me it was a 15meg drive. After I got it home and started tinkering, I discovered that it was in fact a 20meg drive. What a bonus! It has "MEGAPLEX" stamped on the front, and has no other markings. The installation sheets pointed out its 20 meg capability, that it was produced by Micro Smart, Inc., and that it is operated by a KONAN DJ 210 controller. However, upon examination of an update disk which came with it, and exploratory surgery inside the casing, I discovered that it is in fact operated by an OMNI controller (I was told that the 2 controllers are compatible, but I cannot guarantee that). So in the last week I've gotten a much fuller education in hard drives. Since most of the newer HDC's (Hard Disk Controllers) I've seen have been of the convenient autoinitializing variety (meaning that the HDC will initialize the drive on boot-up without external instructions), I was facinated (and annoyed) that this controller needed initialization code. This is a bother since the intialization code must be included in the driver routine which should be sysgened in the system. In this case, the init code required 65 bytes of overhead, which is used only =once= upon system boot, and not thereafter. The other frustrating thing was the driver itself. It required all of 501 bytes of precious low memory area! With my XLR8er installed and appropriate extended memory patches, there was not enough room to install both my EXMEM svc and XMEMDISK/DCT driver (both available in DAVID'S MODEL 4 SYSTEM UTILITIES). These 2 other files are invaluable to me. Even though the @EXMEM svc installed in low memory, as it must, the xmemdisk installed in high memory. Normally this is not a problem as it occupies only a paltry 127 bytes, and can in fact operate in high memory, but since I use my Busy-Calc and BCX spreadsheets constantly, this introduced a problem, as both of these spreadsheet programs, by their design specifications, cannot operate with high memory routines present. In a word, ARGH!

BCX spreadsheets constantly, this introduced a problem, as both of these spreadsheet programs, by their design specifications,

And so David set about learning how to write hard disk drivers in earnest, rather than just examining them out of curiosity. One of the first things I noticed about the current driver was that it was written using a -lot- of inefficient coding. Simply streamlining it saved a lot of memory. I then removed the error processing routine, and cut it down to just report "Extended error" on special hard disk errors (I wrote a program called HDERR/CMD to report precisely what that error was, if I was curious). I also modeled the new driver after the MISOSYS drivers, which in my opinion are the most efficient of any drivers I have ever seen. Thus I cut the module down to only 330 bytes (a 171 byte savings), including the required 65-byte initialization routine. This allowed me more than enough room to install XMEM/CMD and XMEMDISK/DCT into low memory. To save even more bytes, I could have set up the initializer to automatically remove the 65 bytes of initialization code from low memory allocation after it is run, but this would have presented problems if I later loaded another driver and tried to SYSGEN the new configuration. Besides, this shorter driver provides more than enough room for other drivers as it is.

Also, the other reason why I had to write my own driver was so I could also have an LDOS driver to run from the Model III mode. I'm still experimenting, and may come up with an even better driver as time goes by. As I understand it, both the OMTI and KONAN controllers can use the same driver software. Correct me if I'm wrong -- I can only go on what I've been told.

By the way, the other hard disk I have is a 20meg kit from MISOSYS. It uses a very quiet 3 1/2" KALOK 20meg hard disk with a Xebec 1420 autoinitializing HDC. It is a very fast unit, and its driver occupies only 327 bytes of memory. As always, Roy Soltoff packs his code tight. I also think that he made an excellent choice for a HDC, choosing one that does not need a lot of control overhead (such as initialization code), and his choice in hard disks is hard to beat. On top of that, not only are they a snap to attach to your system, but they are also incredibly easy to initialize.

If you have a favorite hard disk, let CN80 know about them, and why you think they are the best. I understand that Roy Beck (213 664-5059) provides prime rebuilt Radio Shack hard disks (5meg, 10meg, 15meg, and 35meg) at very reasonable prices, and includes the efficient MISOSYS controller software in the deal. He also provides JCL files to make initialization a snap. AEROCOMP did sell hard drive disk systems and support software. Is there anyone else who provides these types of services? Let CN80 know and what you think of them. Help your fellow CN80 readers who may be considering a hard disk make a good choice.

PARTITIONING A HARD DISK

After you get a hard disk, probably one of the most important decisions you must make is how to divide the space on the hard disk to work most efficiently for you. After you have performed a low-level format on the disk (a ritual you should go through at least once a year to ensure media freshness =and= reliability), the hard disk must be partitioned and have a high level format performed on it. Partitioning allows you to specify certain portions of the disk for use as certain logical disk drives. Thus you could assign one section to drive :2 and another to drive :3. A high level format simply puts boot and directory information on each partition (floppies have both low and high level formatting performed on them by FORMAT/CMD).

SETUP CONSIDERATIONS

The first step in your partitioning considerations is to determine exactly how much space is on a disk, and how you want to divide it up. This is important because so much depends upon your knowledge of the physical makeup of your hard disk: how many heads and tracks it has. Each hard disk contain at least one platter, which has 2 sides. A platter can thus be visualized as a 2-sided disk. Each side of the platter has 32 individual sectors formatted on it (a sector holds up to 256 bytes of information). This sums out to 64 sectors for both sides. There is of course a read/write head for each surface, and so a hard disk with two platters has 4 heads, one with 3 platters has 6 heads, and one with 4 platters has 8 heads. A physical cylinder (not to be confused with a logical cylinder) is considered to be composed of the a sum of all the tracks for all surfaces. Thus, since there are 32 sectors per track per platter, a physical cylinder is the result of multiplying 32 times the number of surfaces, or heads.

Another consideration is the number of tracks on the hard disk. A typical configuration for various hard disks might be set up as in the following chart, where "meg" indicates size in megabytes, and LENGTH indicates the length of a physical cylinder in sectors:

Type	Heads	Tracks	Length
5meg	4	153	128
10meg	4	306	128
15meg	6	306	192
20meg	4	612	128
30meg	6	612	192
40meg	8	612	256

Some hard disks boast higher usable track counts, such as 615 or 614, for example, as opposed to a "standard" of 612 for a 20meg unit, but in general you can use the above chart as an average guideline. If you do any math on the above information, you may discover that they do not add up to the exact specified megabyte values. For example, the 20meg unit has 4 heads and 612 tracks. 4 heads times 32 sectors per track equals 128, which is the sector length of a physical cylinder. 128 sectors times 612 tracks equals 78,336, which is the number of sectors on the 20meg disk. Multiply this times 256 (for 256 bytes per sector), and the result is 20,054,016. Sure, this is over 20 million, but a megabyte is 1,048,576 bytes long (2 raised to the power of 20, or 1K x 1K). Thus the actual size of our 20meg hard disk is 19.125 megabytes. This is not a rip-off, but is a result of non-technical business people generalizing a megabyte to indicate "about" one million characters. I guess this is something like describing a kilobyte (1024 bytes, or 1K) to be "about" a thousand bytes. Regardless, we do in fact have over 20 million bytes of storage space, so we should be happy (especially now that a "bare" 20meg disk runs about $200 -- sans power supply, case, and cables, instead of the $1,000 for a bare 5meg unit not too many years ago).

Once we know the physical makeup of the hard disk, we must decide how we want to divide it. The reason that we may wish to divide it up and not use it as a single logical drive is that a hard disk can have only a maximum of 203 cylinders (counted zero through 202). This is the maximum size allowed by the allocation table in the DOS for hard disks.

DIVISION METHODS

A further consideration is to take into account the limitations of our hard disk driver software: can it divide a the disk by head offsets, cylinder offsets, or both?

Head offsets are common to the drivers supplied by Radio Shack. What this means is that a partition can be assigned to one or more heads, but the partitions cannot be "layered" on the disk (discussed shortly). This means that on a 5meg drive, a partition is locked into using a total of 153 cylinders with no variations. This constitute the entire track count of the disk, as you may have seen by referring to the chart. The only variability is that we can assign more than one head to a partition (unless the driver is =really= primitive).

Cylinder offsets allow us to layer a partition above another. The advantage to this is that we can use all heads on a track to create one long physical cylinder. We can also vary the number of cylinders we wish to assign to a drive. Most non-Radio Shack hard disk systems use this format. For example, a 5meg unit can be split into 4 partitions of 38 cylinders apiece quite nicely (technically you could have one of the partitions set to 39 to total 153 for all). This allows about 2.5meg per partition. As an aside, if you will be using one partition as the "system" drive, you may wish to make it even smaller and dividing the left-overs for the other partitions, leaving the other "data drive" partitions with a much larger data space (most of the space on a DOS SYSTEM partition is usually wasted otherwise, as we should avoid cluttering it with data files for the simple sake of organization).

The third format is a combination of both head and cylinder offsets. This is the most flexible, as we can size out a partition to almost any format we want. This flexibility is common with hard disk drivers available from MISOSYS.

MIXING DOS PARTITIONS

If you want to run both a Model III and a Model 4 hard disk system off the hard disk, you must consider making certain sections of the disk invisible to the "other" operating system, and making other partitions common to both, if this is allowed by your hard disk driver software.

For example, on both of my 20meg hard disk systems, I have each hard disk divided into 4 partitions, designated as logical drives :0, :1, :2, and :3. With 612 physical cylinders, an even division would allocate 153 physical cylinders per partition. Of course, on my system the first partition is =further= split between LS-DOS 6.3 and LDOS 5.3. For LS-DOS I have 77 cylinders assigned to it, and 76 cylinders set aside for LDOS. I make them invisible to each other by not assigning the other's disk space during my system setup when I am installing my driver software for either DOS.

This capability to render certain space "invisible" comes standard with the MISOSYS software I received with their 20meg hard disk kit (you receive either LS-DOS =or= LDOS support software with the purchase, and must purchase the "other" software package separately), but I was not so lucky with the Micro Smart system I obtained second-hand.

The Micro Smart 20meg hard disk came with LS-DOS 6 software only. Since they had been around for some time, I can assume that they also had LDOS 5 versions, but I believe that they are now out of business, so I was out of luck in obtaining Model III drivers. The driver which came with the unit was typical of most drivers supplied with third party hard disks: they forced you to assign only full cylinders to logical partitions (cylinder offset method). This is normally not a problem, at least up to 20meg units. But 30meg and 40meg units causes a physical cylinder to become quite sizable. For example, a 40meg unit with 8 heads with 32 sectors per head equals out to a 256 sector cylinder. Because you can allocate only up to 8 granules to a cylinder, this means that each granule must be assigned 32 sectors each, which equals out to 8K. Kind of big for a program of less than 256 bytes, which would mean 31 sectors of unusable disk space set aside (the smallest unit of disk space the DOS can allocate is a granule), or something like 7.75K of unusable space. Ouch!

Logical Systems Inc., and MISOSYS, Inc., took to the forefront of efficient disk space allocation by providing disk drivers which could allocate only a certain number of heads =and= cylinders to a hard disk partition. This means that on a 8 headed 40meg drive we could optionally allocate only 4 heads to a partition. This cuts a logical cylinder down to only 128 sectors, or 16 sectors to a granule. If we allocated only 2 heads, we could cut the logical cylinder size down to only 64 sectors, or 8 sectors to a granule. By assigning a smaller number of heads, we can easily cut a granule's size down from 8K (32 sectors), to 4K (16 sectors), to 2K (8 sectors). By the way, 4 sectors equals 1K (1 kilobyte) of disk space.

LSI and MISOSYS also introduced another innovative feature: allowing 2 physical cylinders to be considered 1 logical cylinder. Why? This allows us to assign much more hard disk space to a drive. Thus we could assign up to 406 physical cylinders to a partition. Yes, I know I said that the DOS will allow you to only assign a maximum of 203 cylinders on a hard disk, but this should be interpreted as =logical= cylinders. Of course, by assigning 2 physical cylinders as 1 logical cylinder, this also means that the sector length of a logical cylinder will be twice as long.

For example, suppose we have a 10meg hard disk. This has 4 heads, and so has 4 x 32 = 128 sectors per physical cylinder. 128 / 8 = 16 sectors per granule (4K). Suppose we wanted to assign twice as many sectors to the cylinder, thus allowing 256 sectors to a cylinder, or 32 sectors to a granule (8K)? We could do this by assigning more than 203 physical cylinders to the partition. By assigning more that 203, the more intelligent drivers will take this number and divide it by 2 to obtain the logical cylinder count. Thus we could actually assign the 10meg hard disk to a =single= logical drive. With 306 physical cylinders, this would create a logical drive with 153 logical cylinders of 128 sectors assigned to each logical cylinder. To get into the greasy part of it, this means that there are only 4 granules assigned to a physical cylinder, which is also reflected in the drive control table assigned to the logical drive (This DCT also shows the cylinder count to be only 153 as well). How the DOS sorts this out is by setting a bit in the DCT commonly called the "double bit". On floppy disks, this indicates 2-sided disks. On hard disks, this tells the DOS that the =true= cylinder count is =twice= the amount reported in the DCT. This all may sound complicated, but is actually quite simple once you think it through. This concept is truly genius on the part of its designers (LDOS, the Logical DOS was not named for nothing).

If you have a 6-headed or 8-headed system, you will not be able to assign 2 full physical cylinders to a single logical cylinder simple due to size limitations. Since a single byte can only hold a maximum value of 256 (where zero represents 256), doubling 192 sectors per cylinder for a 6-headed drive, or 256 sectors for an 8-headed drive will produce unreliable =and= unusable results (unless of course we have assigned 4 or less heads to a logical drive, in which case we can do this). For reference to those of you who are techno-types, the way we can assign all space on a disk when we allocated less heads to a logical drive than there are physical heads, is that the DCT also stores the starting head number for a logical drive, which is used as an offset to point the drive to the proper sector number as opposed to a logical sector number. To complete this tower of Babel, the DCT also stores a "starting" track number for the logical drive (some more primitive drivers store this in the driver itself). This feature allows logical cylinder 0 for a partition to actually be located further up on the hard disk, such as physical cylinder 153, for example.

AN EXAMPLE

Hopelessly confused? I was for a long time, myself. To break it down in another way, and perhaps in the process hopefully making more sense, suppose we have an 8-headed 40meg drive where we have only the last 2 heads assigned to logical drive :1. Further, we have also assigned 406 tracks to the drive, which results in a logical drive consisting of 203 logical cylinders (406 / 2 = 203), each logical cylinder is further divided into 8 granules of 16 sectors apiece (4 granules per physical cylinder). To top this hypothetical drive off, its logical cylinder 0 begins on physical cylinder 153.

A FREE display of drive :1 will show a map of the disk with cylinder names from zero through 202, since to the DOS the drive's DCT reports a maximum logical cylinder name of 202. Chances are the Directory will be stored on cylinder 101, unless you had assigned it differently during formatting (using the "DIR=nnn" parameter). Don't worry, the hard disk driver eliminates all the head scratching, so you don't really have to worry about it, unless you want to.

A practical example: suppose a program told the DOS that it wanted to read sector 98 from cylinder 24 of logical drive :1. This is the information that the DOS will send to the logical drive's DCT. The DCT transfers control to the actual hard disk driver routine. The first thing the driver does is compute the actual physical cylinder it wants to look for. It can do this in a variety of ways, depending upon the personal taste of the driver's programmer. One possible method is to double the desire's cylinder's name if the double bit is set, and then adding the physical drive's starting cylinder offset for the logical drive. In our case the double bit is set, so we double the desired cylinder 24 to make it 48. Since our hypothetical drive starts its logical cylinder 0 at physical cylinder 153, we then add 153 to 48, making an actual physical cylinder of 201. The driver then takes the number of heads assigned to the logical drive (2) and computes the maximum sector name for the =physical= cylinder portion assigned to the drive by multiplying times 32 and subtracting 1. This results in 63 (sector names 0 thru 63). We then compare the desired sector (98) to this result. If it is greater (than 63), we increment the physical cylinder count (201) by one (to 202), and then compute the offset on the second physical cylinder within that logical cylinder by subtracting 64 from it. This results in a physical cylinder of 202 and a sector name of 34. We next need to compute the starting logical head number to look on, and so we divide 34 by 32. This results in sector 2 of logical head 1. Finally we add the starting head offset for the partition to the desired logical head number. Since the partition uses only the last 2 heads of the 8 heads, the starting head is the 7th head, or 6 if we use an offset from zero. Thus we add 6 to logical head 1 to obtain a physical head of 7 (the last head on the drive -- 0 through 7). Thus for this hypothetical partition, logical sector 98 of logical cylinder 24 of logical drive :1 actually resides on physical cylinder 202 at head 7 at sector 2. Again, this all sounds complicated, but can become quite fun to figure out if you like to play with numbers. But if you are not so excited about computing this "stuff", then thank the saints that this complicated jumble is figured out for you in the blink of an eye by the hard disk's driver.

Because I desired such flexibility as I have described above, and was in need of an LDOS version of the hard disk driver anyway, I wrote my own drivers for both TRSDOS/LS-DOS 6 and LDOS 5 to support my "new" MEGAPLEX drive, both of which work quite well.

CONCLUSION TO PART I

During part II of my next visit, I'll outline the driver I wrote for the MEGAPLEX hard disk, plus describe essential accompanying utilities, and get those who may be interested in running a more efficient and flexible hard disk driver on their system started, and also show them how to partition a hard disk for =both= LDOS and LS-DOS operation. Until then, HAPPY COMPUTING!
-David Goben

ED-IT REVIEWED

by Chris Fara

An "editor" is a program for writing or changing the contents of text files such as JCL files or "source code" for assemblers and compilers. An editor is not a word processor, but in a pinch it can handle simple letters, memos, etc.

The one outstanding thing about ED-IT is that it's so easy to use. This should make it particularly attractive for computer novices. All operations such as loading and saving files, searching for words, copying, moving and deleting blocks of text, and so on, are done through simple "user-friendly" menus. Just hit [break] any time and a main menu pops up at the bottom of the screen (File Block Search Other Quit). Press the first letter of an item, for example "F" for Files, and a similar sub-menu appears (Load Save New). Hit "L" to load a file, etc. All menus work the same way. Short prompts ask for filenames, words to find, and so forth. If you change your mind then hit [break] in any menu or on any prompt to cancel it. It all gets so obvious after the first use that the well-written and nicely printed 12-page manual is not even needed except for the initial "get acquainted" perusal.

ED-IT has some intriguing features not commonly found in such programs. For example you can execute practically any DOS command without exiting from the editor or losing any text. An unusual feature is the ability to handle special TRS-80 characters such as graphic blocks, "pointing hands", and so on, ie. the characters with ASCII codes higher than 127. Actually any character (except for a few "internal" control codes) can be generated by pressing Control+C and then typing a 3-digit ASCII code.

Another bonus are the screen formatting options. Page width can be defined by the user (20-80 columns) and can include an automatic "word-wrap" that behaves like a word processor: when a word runs over the right margin it doesn't get split but drops down to the next line. The user can also set the tab interval (every 2-20 columns). However, this formatting works only on the ED-IT screen. It is not preserved in the disk file, nor can it be printed out.

Three optional editing "modes" are available to help write "source files" for assemblers, Basic and C-language compilers. When saved in one of those modes, all text other than quoted strings and program comments, gets automatically converted to upper case, and standard extensions ASM, BAS or CCC are added to file names. The editor can handle files up to some 47,000 characters (47-K), but above 10-K the program begins to slow down a bit, and with files larger than 20-K it gets pretty sluggish.

Should you get this program? For one thing, if you are still using TRSDOS 6.2 which, unlike LSDOS 6.3, did not provide any editor, then ED-IT should fill the gap perfectly. Computer beginners will definitely appreciate the easy menus. If you like working on a clean, nicely formatted screen then you'll enjoy ED-IT. On the other hand the lack of any hardcopy function is a surprising handicap in a program that pays so much attention to text formatting. Some unconventional key combinations used for moving the cursor may feel awkward if you are accustomed to other TRS-80 editors and word processors. The ability to execute DOS commands from within the editor is handy, though personally I'd trade it any time for a display of disk directory that would stay on the screen while entering a filename in the Load and Save menu. And a little more pep with large files wouldn't hurt either.

Still, the first impression of ED-IT is also a lasting one: it is clean, friendly and simple, an honest piece of software anybody can use right away without first getting a Ph.D. in computer science (and that's quite a compliment).
-Chris Fara

ED-IT written by Mark Allen Reed is a File editor program for the Model 4 computer. And is available from CN80 for $17.95 + $2 S&H. (See additional information in the display ad section.)

(*Editors Note*) We have used ED-IT for some weeks now, mostly for editing text as we are not programmers. But there are so many features in Mark Reed's ED-IT that are exceptionlly useful over TED that comes with LS-DOS 6.3 and 6.3.1, that we have found it be our editor of choice for text files, especially because it will handle very large files. We have used it on files up to 55K in length. And we have already had reports from programmers that ED-IT has taken the place of their copy of ALDS editor. -Ed.

SYMPHONY 90 UPDATE

Many have asked if Symphony 90 Player System will play ORCH-90 music files. The answer is, yes it will. But we found when we reviewed the music files for ORCH-90 downloaded from bulletin boards that many of those files were full of errors and would not play correctly even with ORC-90. That is the reason why David Goben went thru the complete collection we gave him, correcting the files, and trashing those that had too many errors to make a correction practical, thus creating the Symphony 90 Library. Orch-90 will also, play the Symphony Library Collection files.

THE MODEL ONE CORNER

The Smart One - SMARTWATCH FOR MODEL ONE.

by Arthur N. McAninch, Jr.

As I stated in my last article, "Hopefully, we will have a SmartWatch modification for the Model I by next month." Since I had a Model 4 with a SmartWatch installed, I reasoned that it shouldn't be too difficult to install one in a Model I. I made the short trip down to my local Radio Shack dealer (a franchise here), and paid the $39.95 for another SmartWatch. Since I had already found SMTWATCH/ARC, I studied the instructions that were included in the /DOC file that applied to the Model III. Since my primary Model I had a 3 chip Level II ROM on the little parasite board, I determined that the procedures described for the Model III should work. The only limiting factor that I anticipated was the necessary utility files CLK3/CMD and SMART3/CMD.

I carefully soldered a jumper from pin #26 of the SmartWatch to pin #28, and then installed the SmartWatch into the ROM C socket with pins 1,2,27,28 hanging over the end. Then I installed the ROM C chip into the socket on the SmartWatch with pin 1 of the ROM in socket 3 of the SmartWatch. After turning on the computer, everything worked normally as before, so I set to work to patch CLK3/CMD. Using Super Utility and its search function, I zapped all the unique Model III memory calls to the corresponding Model I calls. Walla! I now had CLK1/CMD. Sure enough, it worked as it should; however, I could not get a version of SMART/CMD to function correctly.

I then wrote a letter to Duane M. Saylor, 854 Eads Court, Newport News, VA 23602, including my registration fee of $10, and asked him if he had an assembly language source file available for SMART3/CMD. He replied promptly, and he provided not only the source code for SMART/CMD, but also the source code for CLK/CMD. In addition, there were already assembled copies of CLK1/CMD and SMART1/CMD. Not only the files, but there was a document file describing how to install the SmartWatch in a 1 or 2 chip Model I. Seems like I re-invented the mousetrap!

Since all of the versions of CLK/CMD and SMART/CMD are copyrighted by Duane, they may not be sold as a separate item or sold with another software package or hardware device. The programs are distributed as "freeware". That is, they may be copied and distributed to others freely. If a user of these utilities finds them useful, he is ask to make a contribution to the author of $10.00 or more as his conscience dictates.

To actually install a SmartWatch in a Model I with the 1 or 2 chip Level II ROM, you should follow the following steps as given in Duane's instructions:

1. Connect a jumper from pin 26 to pin 28 on the SmartWatch. This provides 5 volts for pin 28 of the SmartWatch.

2. Bend pin 20 of SmartWatch so it will not go in pin 16 of ROM socket.

3. Jumper pin 20 to pin 14 of SmartWatch. This provides a ground for pin 20 of the SmartWatch.

4. Remove ROM from mod I. This will be Z34 (the one closes to the Z80) on the two ROM version of the model I. If your model I has only 1 (one) ROM, use that one.

5. Insert SmartWatch into ROM socket with pins 1,2,27 & 28 hanging over the end of the 24 pin socket. Pin 3 of the SmartWatch plugs into pin 1 of the ROM socket.

6. This completes the installation of the SmartWatch in a 1 or 2 chip Model I.

To install a SmartWatch in a Model I with the 3 chip Level II ROM, I offer the following instructions:

1. Connect a jumper from pin 26 to pin 28 on the SmartWatch. This provides 5 volts for pin 28 of the SmartWatch.

2. Remove ROM C from the Model I. Find the three ROM chips mounted on the extra little circuit board attached to the main CPU board with double stick tape. ROM C should be the 24 pin chip next to the 74LS42 chip, and the ROM C chip should have the designation 3108015C.

3. Insert SmartWatch into ROM C socket with pins 1,2,27 & 28 hanging over the end

of the 24 pin socket. Pin 3 of the SmartWatch plugs into pin 1 of the ROM socket.

4. Insert ROM C into SmartWatch Socket such that it is aligned with the ROM socket on the circuit board. Note that pin 1 of the Boot ROM will be in pin 3 of the SmartWatch socket which in turn is in pin 1 of the socket on the circuit board.

5. This completes the installation of the SmartWatch in a 3-chip Model I.

The names of the 2 SmartWatch utilities are as follows:

CLK1 - For Model I under LDOS 5.x.x, TRSDOS 2.x, DOSPLUS 3.x, MULTIDOS
SMART1 - For Model I under LDOS 5.x.x

CLK and SMART will be used as the name of the SmartWatch utility used in the remaining discussion.

The first order of business after you install the SmartWatch in your computer is to set the time into the SmartWatch. This is done with the command:

```
CLK S hhmmssMMDDYYdm
```

Where:
hh = hours (0-23)
mm = minutes (0-59)
ss = seconds (0-59)
MM = month (1-12)
DD = date (1-31)
YY = year (0-99)
d = day of week (1=Sunday, 7=Saturday)
m = mode (A=AM, P=PM, omit for 24 hour format)

Since the TRS-80 operating systems use 24 hour time you should omit the m parameter when setting the time in the SmartWatch.

Once you have set the time you need to disable the system DATE and TIME prompts. If you are operating in a hard disk or memdisk environment you must first make the boot floppy your drive 0. The issue the command "SYSTEM (DATE=NO)" and "SYSTEM (TIME=NO)". Then you can "AUTO CLK T". At this point you can turn off the computer, then turn it back on and boot. The SmartWatch time will be displayed and your system time will be set. Alternately if you normally start with a /JCL file of some sort, just add the command "CLK T" to the beginning of your startup /JCL file.

Another available command is "CLK O" which will turn off the SmartWatch. This will save the battery if you are going to be keeping the computer idle for a year or so! To restart it you will have to use the "CLK s hhmmssMMDDYYd" command.

The command "CLK" by itself will display a list of available commands.

If you issue any command with the SmartWatch not installed or installed improperly you will get a "No SmartWatch Present" message.

If you turn the SmartWatch off and then issue a command you will get a "The SmartWatch is not Set" message.

CLK1 will run fine under NEWDOS 80. To turn off the prompt for Date and Time just issue the command "SYSTEM :0 AY=N AZ=N". Then do an "AUTO CLK1 T" to force automatic running of the time setting utility.

CLK1 will run fine under DOSPLUS 3.3, 3.4 and 3.5. Just do an "AUTO CLK1 T" to force the automatic running of the time setting utility. If you are using DOSPLUS 3.5 you will also have to do a "SYSTEM (DATE=NO,TIME=NO) to turn off the prompts for Date and Time.

NOTE: SMART1 works ONLY with LDOS! SMART is a background task that can be installed in memory and SYSGENed. It requires the installation of the Dallas Semiconducter SmartWatch DS 1216E as described in the CLOCK/DOC file. The Model I version takes 266 bytes of memory. Once installed, any time lost by the system clock during disk I/O will automatically be corrected within the time interval you have specified.

SMART1 (TIME=,SLOT=,YANK=) - MODEL I under LDOS

TIME= is the time interval for the task to update the system clock.

SLOT= is the slot in the task vector table.

YANK= permits removal of the task module or disabling of the task.

The slot and the time update interval is selected when you install. Slots 0 to 7 are suggested and time intervals 1 to 63 seconds. The default slot is 0 and the default interval is 60 seconds. The interval is not exactly the number of seconds entered but is within 7%. Thus if you enter T=60 you will actually update every 64.25 seconds. More accuracy would require multiplying the number input by 3.74 instead of 4. Multiplying by 4 in assembler is two rotate instructions. Multiplying by 3.74 gets a bit more complicated!

Once installed the time update interval can be changed by using the T parameter with a different number. If you enter a number larger than 64 the resulting time interval used is modulo 64. Thus if you enter a Time of 65 you will get 1 second. If you enter a time of 64 you will get 63.75 (approx).

If the SMART module is the first one in memory above HIGH$, it can be removed by using the Yank parameter. Again the Yank parameter can be shortened to Y if desired.

If the SMART module is not the first one in memory above HIGH$, the background task will be disabled but the SMART module will remain in memory. If the task has been disabled, it can be re-enabled by giving the SMART command with no parameters (in which case the default interval of 60 seconds will be used) and the task will be installed in the same slot it was removed from. You can also specify a selected time interval using the T parameter.

The SmartWatch, 25-1033, as sold by Tandy for $39.95, is manufactured by Dallas Semiconducter. They call it the SmartWatch DS121E. It is available from several suppliers as the "No-Slot Clock" for $29.95.

TOUCH1/CMD

In my last article I also stated, "I now have TOUCH1/CMD* ... on line." Since I wanted to make this available to others, I took my notes from zapping TOUCH3/CMD, and wrote a patch file and sent it to Ken Peck and asked him to include my patch file in a revised TOUCH/ARC file. Well, several folks on the MOD134 national echo picked up on our discussion and decided to include TOUCH/ARC in the next TRSLINK. Because of an error on my part, the TOUCH1/FIX that was released on TRSLINK43 is in error! Please forgive me if you are a Model I user who was totally frustrated when the fix wouldn't work! Here is the corrected version which I call TOUCH1/JCL:

```
. touch1/jcl
. This jcl file will patch TOUCH5/CMD by
Ken Peck
. for use on the Model I as TOUCH1/CMD
w/LDOS 5.1.5
. (see TMQ IV iv, p 19)
. Copy TOUCH5/CMD to TOUCH1/CMD
. Execute this fix by DO TOUCH1
PATCH TOUCH1/CMD (D04,F0=49 44)
PATCH TOUCH1/CMD (D05,B5=18 43)
PATCH TOUCH1/CMD (D0E,AF=70 44)
PATCH TOUCH1/CMD (D0E,BA=5D)
PATCH TOUCH1/CMD (D0E,C6=6D 44)
PATCH TOUCH1/CMD (D0E,D1=5A)
PATCH TOUCH1/CMD (D1C,40=3E 40)
. EOP
```

While I am at it, here is the fix to OOPS3/CMD to produce OOPS1/CMD:

```
. oops1/fix
. This fix file will patch OOPS3/CMD by
M.A.D. Software
. for use on the Model I as OOPS1/CMD
w/LDOS 5.1.5
. (Note: if patching on LDOS 5.1.4/5 then
you MUST delete
. the :F0x,xx=xx xx because the PATCH
routine will
. not recognize this FIND syntax)
. Copy OOPS3/CMD to OOPS1/CMD
. Execute this fix by DO OOPS1/FIX
PATCH OOPS1/CMD (D00,1B=3E
40:F00,1B=1F 44)
PATCH OOPS1/CMD (D03,DC=18
43:F03,DC=25 42)
PATCH OOPS1/CMD (D03,E4=18
43:F03,E4=25 42)
PATCH OOPS1/CMD (D03,E7=05
44:F03,E7=99 42)
PATCH OOPS1/CMD (D05,08=6D
44:F05,08=36 30)
PATCH OOPS1/CMD (D05,58=C4:F05,58=51)
. EOP
```

(Patch lines should be written as one complete line with no space at the end of one patch line and the following line.)

DOUBLERS

In response to some mail I have received, several persons have said they have the Radio Shack Doubler installed, and they enjoy running the Radio Shack Double Density operating system, TRSDOS 2.8DD. As I replied to them, they really don't know what they are missing! LDOS 5.1.x is designed to run on either the Radio Shack doubler or any of the after-market doublers. The file included on the Model I version of LDOS that shifts the DOS to double density is called RDUBL/CMD for the Radio Shack doubler, and PDUBL/CMD for any of the other doublers. If you are not running LDOS on your double density Model I, then order a copy of the LDOS 5.1.4 manual immediately from MISOSYS, Inc., P.O.Box 239, Sterling, VA 22170-0239, or call Roy Soltoff at 703-450-4181. Ask Roy if he has copies of the LDOS 5.1.4 disks for the Model I as well. The Master Distribution disks for LDOS 5.1.4 for the Model I came on two Single Density 35 track floppies. The documentation explains how to create a double density working diskette for either the Radio Shack doubler or the "other" doublers. For those of you who for some reason (perhaps nostalgia), want to keep your Model I absolutely Radio Shack proprietarily pure, remember that LDOS 5.1.3 was indeed licensed to Radio Shack at their expense. That is why it will run on their doubler! Version 5.1.4 is just an upgrade to the earlier version. When you order the 5.1.4 manual, you should also order the utility called SOLE. This little utility makes it possible to boot directly to double density, without having to initially boot up with a single density disk and then swap disks as the LDOS manual describes.

OTHER PROJECTS UNDERWAY

Unless there are a number of letters asking for specific Model I discussions, I won't be writing any more articles for a while. Instead, I have begun writing a new owner's manual for the Model I. The most asked for thing I hear, is for a dos/BASIC manual. I plan to write a manual to combine the instructions Radio Shack provided for Level II BASIC, the TRSDOS 2.x manual, the Expansion Interface Owner's manual, and the RS232 owners manual along with some information gleaned over the years through personal experience and reading of others' experiences with the little computer the 'Shack produced that started all this microcomputer revolution! After I get this manual completed, I'll probably do one for LDOS on the Model I.

Have a great forever,
-Art McAninch

(*Editors Notes*)

SmartWatch Chip (Called No-Slot Clock in the IBM Catalogs.) is available from:
JDR Microdevices
2233 Branham Lane, San Jose, CA 95124
Toll Free Number 800-538-5000
Cat # NOSLOT-CLK.....$29.95

The File Cabinet Disk M4UTL49 Model 4 Utility Disk has the following program files for use with SmartWatch.

SMART/ASM	Source Code for SmartWatch Drivers
SMART/DOC	Documentation for SmartWatch drivers.
SMART3/CMD	SmartWatch driver for LDOS for Model 3.
SMART4/CMD	SmartWatch driver for TRS/LS-DOS 6.x for Model 4.
CLK3/ASM	Source code for CLK3/CMD
CLK3/CMD	SmartWatch driver for Model 4 (in 3 Mode)
CLK/ASM	Source code for CLK3/CMD
CLK4/CMD	SmartWatch driver for Mod 4.

*TOUCH/CCC is a command that allows you to set the modification date (and time for LS-DOS 6.3)
TOUCH/CCC
TOUCH/DOC
TOUCH1/CMD
TOUCH1/JCL
TOUCH5/CMD
TOUCH6/CMD
mentioned in Art's article are available on the File Cabinet Disk M4UTL62.

INSTALLATION INSTRUCTIONS FOR SMARTWATCH IN A MODEL III, 4 and 4P.

by Duane M. Saylor (1987)

Reprinted from the File Cabinet Disk #49.

MODEL III INSTALLATION

1. Connect a jumper from pin 26 to pin 28 on the SmartWatch. This provides 5 volts for pin 28 of the SmartWatch.

2. Remove ROM C from the Model III. This should be U106 and is the rightmost ROM of the 3 ROM's in the bottom right corner of the main circuit board when viewed from the rear. The ROM should be a Motorola MCM68A316.

3. Insert SmartWatch into ROM socket with pins 1,2,27 & 28 hanging over the end of the 24 pin socket. Pin 3 of the SmartWatch plugs into pin 1 of the ROM socket.

4. Insert ROM into SmartWatch Socket such that it is aligned with the ROM socket on the main circuit board. Note that pin 1 of the Boot ROM will be in pin 3 of the SmartWatch socket which in turn is in pin 1 of the socket on the main circuit board.

5. This completes the installation of the SmartWatch in a Model III.

MODEL 4 INSTALLATION

1. Connect a jumper from pin 26 to pin 28 on the SmartWatch. This provides 5 volts for pin 28 of the SmartWatch.

2. Remove ROM C from the Model 4. This should be U70 and is the rightmost ROM of the 3 ROM's below the Z-80 chip. The ROM should be a Motorola MCM68A316. The Tandy part number is 8048316 on my board. Other part numbers may be used in other Model 4's.

3. Insert SmartWatch into ROM socket with pins 1,2,27 & 28 hanging over the end of the 24 pin socket. Pin 3 of the SmartWatch plugs into pin 1 of the ROM socket.

4. Insert ROM into SmartWatch Socket such that it is aligned with the ROM socket on the main circuit board. Note that pin 1 of the Boot ROM will be in pin 3 of the SmartWatch socket which in turn is in pin 1 of the socket on the main circuit board.

5. This completes the installation of the SmartWatch in a Model 4.

MODEL 4P INSTALLATION

1. Connect a jumper from pin 26 to pin 28 on the SmartWatch. This provides 5 volts for pin 28 of the SmartWatch.

2. Bend pin 20 of SmartWatch so it will not go in pin 18 of ROM socket.

3. Jumper pin 20 to pin 14 of SmartWatch. This provides a ground for pin 20 of the SmartWatch.

4. Remove Boot ROM from 4P. This will be U69 on the gate array version and U70 on the nongate array version. The ROM should be a Motorola MCM68A332. The Tandy part number on the gate array version is 8075332.

I do not know what the part number is for the nongate array version.

5. Insert SmartWatch into ROM socket with pins 1,2,27 & 28 hanging over the end of the 24 pin socket. Pin 3 of the SmartWatch plugs into pin 1 of the ROM socket.

6. Bend pin 18 of the Boot ROM so it will not insert into pin 20 of the SmartWatch. Insert ROM into SmartWatch Socket such that it is aligned with the ROM socket on the main circuit board. Note that pin 1 of the Boot ROM will be in pin 3 of the SmartWatch socket which in turn is in pin 1 of the socket on the main circuit board.

7. If you are installing the SmartWatch in a gate array 4P, connect a short piece of wire from pin 18 (The pin you bent out in step 6 above) of the Boot ROM to pin 18 of U27. U27 is a 74LS244 Octal Buffer. This connects A11 (Address line 11) to the Boot ROM.

8. If you are installing the SmartWatch in a nongate array 4P, connect a short piece of wire from pin 18 (The pin you bent out in step 6 above) of the Boot ROM to pin 18 of U26. U26 is a 74LS244 Octal Buffer. This connects A11 (Address line 11) to the Boot ROM.

9. This completes the installation of the SmartWatch in a Model 4P.

SOFTWARE UTILITY FOR THE SMARTWATCH IN A TRS-80.

The names of the 4 SmartWatch utilities are as follows:

CLK3 - For Model III, Model 4 and 4P under LDOS 5.x.x
CLK4 - For Model 4 and 4P under TRSDOS 6.x and LS-DOS 6.x

CLK will be used as the name of the SmartWatch utility used in the remaining discussion. Substitute the correct name as listed above for your machine and operating system.

The first order of business after you install the SmartWatch in your computer is to set the time into the SmartWatch. This is done with the command:

```
CLK S hhmmssMMDDYYdm
```

Where:
hh = hours (0-23)
mm = minutes (0-59)
ss = seconds (0-59)
MM = month (1-12)
DD = date (1-31)
YY = year (0-99)
d = day of week (1=Sunday, 7=Saturday)
m = mode (A=AM, P=PM, omit for 24 hour format)

Since the TRS-80 operating systems use 24 hour time you should omit the m parameter when setting the time in the SmartWatch.

Once you have set the time you need to disable the system DATE and TIME prompts. If you are operating in a hard disk or memdisk environment you must first make the boot floppy your drive 0. The issue the command "SYSTEM (DATE=NO)" and "SYSTEM (TIME=NO)". Then you can "AUTO CLK T". At this point you can turn off the computer, then turn it back on and boot. The SmartWatch time will be displayed and your system time will be set. Alternately if you normally start with a /JCL file of some sort, just add the command "CLK T" to the beginning of your startup /JCL file.

Another available command is "CLK O" which will turn off the SmartWatch. This will save the battery if you are going to be keeping the computer idle for a year or so! To restart it you will have to use the "CLK s hhmmssMMDDYYd" command.

The last command is "CLK". This will display a list of available commands.

If you issue any command with the SmartWatch not installed or installed improperly you will get a "No SmartWatch Present" message.

If you turn the SmartWatch off and then issue a command you will get a "The SmartWatch is not Set" message.

SUPPORT OF "ALIEN" OPERATING SYSTEMS

Using CLK3/CMD with NEWDOS 80 Version 2.0

CLK3 will run fine under NEWDOS 80. To turn off the prompt for Date and Time just issue the command "SYSTEM :0 AY=N,AZ=N". Then do an "AUTO CLK3 T" to force automatic running of the time setting utility.

Using CLK3/CMD with DOSPLUS

CLK3 will run fine under DOSPLUS 3.3, 3.4 and 3.5. Just do an "AUTO CLK3 T" to force the automatic running of the time setting utility. If you are using DOSPLUS 3.5 you will also have to do a "SYSTEM (DATE=NO,TIME=NO) to turn off the prompts for Date and Time.

Using CLK3/CMD with TRSDOS 1.2 and 1.3

For those of you that still run TRSDOS 1.2 or 1.3 on occasion for some unknown reason, I have also done the necessary research to permit use of CLK3/CMD with both TRSDOS 1.2 and 1.3.

TRSDOS 1.2 must be patched as follows to turn off the prompt for Date and Time during a cold boot:

```
PATCH *0 0
(ADD=4EAB,FIND=CA154FED53B542,CHG=
ED53B542C3204F)
```

TRSDOS 1.3 must be patched as follows to turn off the prompt for Date and Time during a cold boot:

```
PATCH *0 0
(ADD=4EA9,FIND=CA2E4FED53B542,CHG=
ED53B542C3394F)
```

CLK3 must also be patched to use a different system call for display of strings. This can be accomplished with:

```
PATCH CLK3/CMD
(ADD=524B,FIND=6744,CHG=1B02)
```

THE NEWCOMERS CORNER

For Novices, Beginners and First Time TRS-80 Users. Part 4

USING LIST

by CN80 Staff

Back in part one of this series (V.4 No.5, May 1991) we told you that there were eight command words that worked from DOS ready, that you really needed to know and understand their application to get the most out of your computing. So far we have covered FORMAT (V.4 NO.6, June 1991) and in the last issue we covered DIRectory. In the very first installment of this series we mentioned the use of LIST several times, but here we want to go in to the application of LIST a little deeper.

The LIST command is used from DOS ready to place the contents of any file up on your screen. This works best if the file you are reading is an ASCII file. That is a file that has been saved in the ASCII format. Most word processing programs, spreadsheet programs and data base programs have the ability along with BASIC to save your file in ASCII.

ASCII stands for American Standard Code for Information and is the standard code for representing characters as binary numbers. It is used on most microcomputers, computer terminals and printers. An ASCII file is simply a text file stored in the ASCII character set. When you save a file to disk from within a given application program such as Scripsit, Visacalc, BCX, etc. it stores the file in a manner that only that application can read. But if the same file is stored in ASCII, then you can read it with out having the program available in your system. A file saved in ASCII is sometimes referred to as a "TEXT FILE", meaning that it is a file that contains lines of written information that can be sent directly to the screen or printer by using ordinary operating systems commands.

Suppose you have a file, saved in ASCII called Myfile and you want to see what is in it. You would type at DOS ready:

```
LIST MYFILE <ENTER>
```

This command will send the file to your screen.

If you type:

```
LIST MYFILE (P) <ENTER>
```

Then the contents of Myfile will be sent to your printer. Check your DOS manual for the correct (parameter syntax) for your computer and DOS. Model 4 owners using TRS/DOS 6.x.x can use just the letter (P), while Model 3 owners using LDOS would use (P) or (PRT) if they were using TRSDOS 1.3.

If you get what seems to be a lot of garbage on your screen when trying to read a file, then you have tried to read a file that was saved in Machine Language, or it was saved by an application program and it is not an ASCII file.

SCROLLING

Scrolling is the term used to describe the movement of lines across your screen. In most cases when you list a file to the screen it scrolls so fast you can't read it. But there are several ways this too-fast scrolling can be handled. TRS 1.3 users will be able to slow down the scrolling of a file by using the parameter SLOW.

Example: At DOS ready type:

```
LIST MYFILE (SLOW) <ENTER>
```

The SLOW parameter added to your command line will slow the scrolling down so you can read it. Press the @ key to pause, press <Enter> to continue. Press the Break key to stop the process at anytime and return to DOS ready.

Model 4 users using LSDos 6.3.1 already have scrolling under control by the DOS because using LIST with LS-DOS 6.3.1 will fill the screen up with 23 lines, stop and wait, for you to tell it to continue. If for some reason you do not want it to pause between screen pages, you can type

```
LIST MYFILE (NS)<ENTER>
```

and the text of the file will scroll across the screen without stoping till the end of the file.

Model 4 users who are not using LS-DOS 6.3.1, press shift @ to pause and press the Spacebar to continue.

There is a self-installing file called PLC/FIX which will add paging to LS-DOS 6.3 and eliminate the need to hit shift and @ key to stop the text from scrolling if you are still using LS-Dos 6.3 on your model 4. We placed it on our CN80 disk series Number 10 as a bonus program.

ADDITIONAL COMMANDS
Most of the additional syntax commands used with the LIST are fairly common between all the DOSs, check your manual that came with your DOS disk, or refer to your Mod by Chris manual for further information. These additional commands are for special "look-see" applications that might be used by a programmer, or to view a BASIC program. But for the casual user the printout (P) or (PRT) command is the only one you need to remember.

WHY LIST
Suppose you have a disk from the File Cabinet or a friend and you want to see what a particular file is. You can use your LIST command to read the contents of the file. If it is a text file you will get a nice screen of text in sentences, paragraphs, etc. If not then you will get a screen that has a lot of strange characters. Or if it is a BASIC file you will get the BASIC program sent to the screen, with line numbers starting each line of text.

Common usage of the LIST command is to view or print files which you are not familiar with to see what kind of file it is. Or to print out a /DOC or /TXT file which would contain the operating instructions for a program that might be on the same disk.

WHAT ELSE CAN I DO WITH LIST
Not much. There are no word processing or editing features in the LIST program. All you can do is look at a file or print it out.

WHAT IS BETTER TO USE THAN LIST
For one, David Goben's File Utilities Packages for the Model 4 or Model 3, has a utility program called DSPTXT/CMD, which stands for "display text." Using this program you can view a file, page at a time, you can read the file forward or reverse using the up and down arrow keys. Change the margin settings (leaving room for three hole punch as an example). Change the page length and it has the ability to print out any graphics that may be present in the file you are reading.

Second there is Mark Allen Reed's ED-IT (announced in this issue and for Model 4 only) which you can use to read a file, edit the text and store the changed text in a new file, or overwrite the original file.

Having both these utility programs residing on your DOS disk gives you a lot of power to read unfamiliar files. With a little practice you will be able to recognize what these files are as you view them.

TRSLINK UPDATE

As of this printing we have not received any word on the availability of Trslink #44, the July issue or #45 to follow. Refunds will be made to those of you who have standing orders for Trslinks with CN80 if it appears there are to be no new TrsLinks.

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REMINDER

IF the last four digits on your mailing label is 91/08, then this is your last issue. Time to get your renewal in the mail.

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MY ADVENTURES WITH HARD DRIVES

Part 8 - Radio Shack Hard Drives and the "Three Wires"

by Roy T. Beck

INTRODUCTION

How many of you have opened up a Radio Shack hard drive box, attempted to remove the bubble (the actual hard drive), and discovered the infamous three wires (orange, white and yellow) soldered to various places on the PC board of the bubble itself? Rather daunting when you first discover this little bit of circuitry.

Some time ago, I made reference to these wires in an earlier article of this series, promising someday to explain what they are all about. Recently I had to chase out all of these in order to accomplish a special task, and this seems like a good time to publicly document them.

FEATURES PROVIDED

While the wires appear to be a haphazardly applied afterthought, the underlying principles make pretty good sense when you understand the why's and wherefore's.

One of the purposes is the implementation of hardware Write Protect (WP) on the hard drive. Radio Shack thought this was a desirable feature, and proceeded to add it to their design. The drawback is that all partitions within the drive will be write protected or none will be. If you want to write protect only one partition, use the software WP provided in the DOS. See the SYSTEM command for further details. I personally never use the hardware WP, but I keep it available in the drives I sell.

Another feature was an activity light. Of course, almost every bubble has its own activity light, but RS decided to have a consistent front panel for all their master and slave drives, regardless of size. Furthermore, RS allowed for the use of a master and up to three slave drives, and the activity lights also serve as select lights, showing which drive is active at any given moment. Those of you who have only one 5 Meg drive may never have realized that that lonely green light staring at you is saying, "Drive :X is selected". If you have two or more drives, then only one will show a standing green light, whichever was last selected. Of course you know that the light blinks off briefly when the drive is being written to or read from. When you understand that the green light is both a SELECT light and an ACTIVITY light, then the extra wires make better sense. This is only true of the 5 Meg units and some of the 12 and 15 Meg units which also had the old (large) hard drive controller board (HDC). The later drives with the newer, small HDC have the select light normally dark, blinking on when the heads are stepping.

The slave units function in the same manner as the older master units. That is, the green light is on when the drive is selected, and flickers off when it is stepping.

If you have opened a slave drive box, you know there is a FOURTH wire in those boxes. This provides the automatic turn-on feature so that no key switch has to be operated on slave drives.

FUNCTIONAL PRINCIPLES

How do RS's circuits operate? To implement write protection, RS added several pieces of logic to the hard disk controller board (HDC), and made use of some unused wires in the 20 conductor and 34 conductor drive cables. The write protect circuit consists of the red lamp, the push on-push off switch combined with it, trace number 5 in the 20 conductor cable, and a couple of gates on the HDC. If you try to write to a protected drive, an AND gate will detect this and trigger an interrupt in the operating system, which immediately terminates the attempted write.

The activity light circuitry has two inputs. The first of these is the drive SELECT* circuit present on every 5 inch HD and which is normally connected to an LED on the front of the bubble. RS omits the LED on the bubble and utilizes the select logic to provide a signal to an additional circuit in the master or slave box consisting of one or two chips which control the filamentary green lamp on the front of the box. Radio Shack also chose the SEEK COMPLETE* signal which is fed back from the bubble to the HDC on line 8 of the 34 conductor cable. By suitably inverting and ANDing these two signals in the lamp driver circuit, RS causes the green light to flicker on the selected drive. Thus the green light shows when the drive is selected and flickers when its heads are seeking. Due to design differences between the older and newer HDC's the old boards caused the green light to be normally ON on the selected drive, flickering OFF when the drive is stepping the heads. The later HDC has the green light normally OFF, flickering ON only when the heads are stepping.

The last function, which occurs in slave units only, is the automatic turn-on. When the master drive is powered up, it sends out 12 volt DC on line 7 of each 20 conductor slave cable. The fourth (yellow) wire in a slave drive feeds the 12 V to a relay which responds by turning on the power supply in the slave drive.

HARDWARE DIFFERENCES

Historically, all of the above (except the auto power-on) was first applied to the 8.4 Meg drive, which was the first HD offered by RS. The circuits in that package set the pattern for all following TRS HD's up through the 70 Meg drive.

As each new (larger) bubble was selected by Radio Shack for sale in the marketplace, the connection points of the three wires had to be solved all over again, especially since not all drive manufacturers used the previously chosen lines in the ribbon cables in the same way. Fortunately, RS used Tandons for most sizes, and there is commonality among those drives. The 35 Meg drive is by Quantum, and I have never seen the 70 Meg drive so I do not know which vendor supplied the bubble used in it. Anybody know for sure?

Two different hard disk controllers were used, one known as the 8X300 board (this is the old, large board), and the other is the WD-1010 (newer, small board). (The numbers correspond to a particular large chip on each board). The early, large board was used in the 5 Meg drives and some of the 12 and 15 Meg units. The small board was used in the 12, 15, 35 and 70 Meg drive. There are some differences between them. The write protect logic is similar, and the 12 volt feed to the auto-on circuit in the slaves is the same, but there is a small difference in the SELECT/BUSY lamp driver circuit. The old (8X300) board uses a 75453 chip, which has a two input NAND gate in it. The newer (WD-1010) board uses a 75452 chip, which has a two input AND gate. A 74LS14 inverter gate is added to invert one of the inputs, making one input active high and the other active low.

The later board has a jumper to connect either E-13/E-14 or E-14/E-15 to allow the Write Protect to be disabled or enabled, respectively.

There is also another version of the WD-1010 board, sold as an external, stand alone unit under catalog No. 26-1138. This has some jumpers and trace cuts, but was originally the same WD-1010 unit sold for use with the 15 Meg drives. The trace cuts can be easily restored and the jumpers can be removed to make it identical to the WD-1010 in the 15 Meg drive. The jumper at E-13/E-14 has to be shifted to E-14/E-15 to make the write protect circuit operational.

And then there is the slave drive! Since it has no HDC, R/S had to provide some logic for the WP and SELECT lamp circuitry. They created a little board with a 75413 on it which contains two lamp drivers, each controlled by a dual input NAND gate. This board mounts in the slave HD box near the power supply, and connects to the front panel switches and also via three wires to the bubble. The slave drive also has a fourth (yellow) wire which comes from a point on the bubble and runs to the coil of the power relay. This arrangement uses 12 Volts from the master drive to turn on the slave power supply.

Note that the colors of the three wires in a master drive do not match the corresponding wires in the slave drive! RS, in their infinite wisdom, used a different set of colors for the wires, see table 1.

SUBSTITUTION OF BUBBLES

Quite a few people have wanted to replace a small R/S bubble with a larger unit. There is no problem in doing this if you know what to do with the three wires, (four in the slave box). Items to be considered are as follows:

1. Only one pullup resistor pack should be in use, just like floppies. If you have more than one HD, be sure to remove the resistor pack from the slave drives.

2. Connect the three (or four if it is a slave)

wires. See Table 1 for details. Use the connection information under the "generic" column heading. Because the line chosen by RS for the write protect signal has been used differently by the various bubble manufacturers, it is important to insure there is no feedback of +5 or +12 volts into the internals of the bubble. To be sure of this, read and follow the notes in Table 1.

3. Rework the partitioning to fit the larger drive. Items to be input to the driver when creating new partitions include:

Drive number (1 if you have only one bubble, 1 or 2 if you have two).

Step rate (try 10 microseconds, use it if it works; otherwise set for 3 or 4 milliseconds). Whatever works!

Number of cylinders, 1024 maximum.

Number of heads, 8 maximum

Note from the Legal Eagles:

As always in modifications and advice of this sort, anyone who opts to do the changes is doing so at his own risk! The author has offered his best advice, but will not be responsible for consequential damages of any sort. (I think that's the way the lawyers phrase it!)

GENERIC CONNECTION OF THE THREE WIRES

The original Radio Shack connections of the three wires were always to unique points on the PC boards of each different bubble. While this was fine for assembly line work where the same bubble was used repetitively, It is a complete pain when a user like us wants to connect a strange bubble in place of the original RS bubble. To solve this problem, I have worked out alternate connections which are usable for any MFM bubble with the ST-506 interface, not just the original RS units.

By soldering the three wires in the master to the HDC, instead of to the bubble, the bubble can be easily swapped in the future as desired without disturbing the three wires. This can be accomplished by soldering the three wires to specific points on the HDC, (which is where the three wires end up anyway).

Since there is no HDC in the slave drives, and since there is a fourth wire to deal with, I don't recommend messing around with them. Put a bigger bubble in your master, and don't use the slave! For those who insist, I have included the slave unit in the table, but it is not as simple as the master drive. I have determined where on the cables to connect each of the wires. Two wires need to be cut free from the 20/c edge card connector to prevent feeding 5 or 12 volts into the hard drive (bubble). These two wires are then spliced to two of the four wires from the front panel. The other two front panel wires need to be spliced onto two wires in the 34/c cable, but the wires in the cable are left intact.

Table 1

Wire Color	Function	Original Tandon Connection	Generic Connection
Early Masters with large HDC's, 8X300 type			
Orange	Write Protect*	TP18	Pin 6 of HDC Resistor Pack R27 Note 1
Yellow	Drive Select*	U21-8	HDC J6 Pin 26 Note 5
White	Seek Complete*		U7-5 HDC J6 Pin 6 Note 5
Late Masters with small HDC's, WD1010 type			
Orange	Write Protect*	TP18	End of HDC R54 nearest J10 Note 2
Yellow	Drive Select*	U21-8	End of HDC R23 nearest U23
White	Seek Complete*	U7-5	End of HDC R38 nearest U28

Slave Units (No HDC's)

Yellow	12 V Power On	TP-19	Line 7 of 20/c cable Note 3
Blue	Write Protect*	TP-18	Line 5 of 20/c cable Note 4
Orange	Drive Select*	U21-8	Line 28, 30, or 32 of 34/c cable Note 6
Brown	Seek Complete*	U7-5	Line 8 of 34/c cable

Notes

1. Solder wire to feedthrough near pin 6. Cut trace to Pin 5 of J1 to prevent feeding 5 V into the 20/c cable.

2. Cut trace to Pin 5 of J6 to prevent feeding 5 V into the 20/c cable.

3. Cut Wire #7 in 20/c cable to prevent feeding 12 V into the bubble.

4. Cut Wire #5 in 20/c cable to prevent feeding 5 V into the bubble.

5. Use empty pin hole of J6 instead of J5.

6. Select wire # to agree with drive :1, :2, or :3.

LAZY MAN'S SOLUTION

The Lazy man's solution for the WD1010 (new) HDC. Disconnect the three wires from the bubble in the master unit, tape the ends and tuck them out of the way. Move the jumper on the HDC to join E-13 and E-14. This disables the write protect circuit for the master and all slave drives and both lights of the master drive, but the drive works OK. This scheme won't hurt anything and you can use software Write Protect function.

The lazy way on the old 8X300 HDC is to cut and tape the white and yellow wires. Connect the orange wire through a 470 ohm, 1/2 watt resistor to a source of +5 volts. This is necessary to prevent the logic from setting a permanent write protect signal on the master bubble.

On a Slave drive with the new, small HDC, connect the fourth (yellow) wire to wire #7 of the 20/c cable to get the 12 V to operate the power relay. (Or, you can use a manual switch to bypass the relay). Cut and tape the other three wires. You also must move the jumper in the master drive to E13-E14. If you forget this jumper, the hard drive will be permanently write protected! No harm done, you just can't write to the drive. Use software WP with this setup.

If you have the old HDC, connect the yellow and blue wires as shown in Table 1. Cut and tape the other two wires.

CREDITS

Dave Dalager of Arlington, Texas is very knowledgeable of these drives, and I wish to thank him for his helpful advice. He offers the following useful recommendation:

Connect a 470 ohm, 1/2 watt resistor across the red lamp socket on the front of each drive. The purpose of this is to allow the write protect to function regardless of the lamp. Without this, you may suddenly discover your hard drive has become write protected for no obvious reason; the real reason being either a burned-out lamp or one which makes poor connection in its socket.

COMMENTARY

Unfortunately, the Radio Shack Technical Reference and Service Manuals are not very helpful in working out the connections of the three (or four) wires. Radio Shack's practice in all of their manuals is to show explicitly what is on the printed circuit boards, and to include some details of the interconnecting cables. The problem is they don't clearly show which wires in which cables go to which PC board terminals. In other words, they don't show interconnecting wiring diagrams. I have seen enough of their different hard drives to document their design, and Table 1 is the result of that review and analysis.

REFERENCES

Since the 12 and 15 Meg units were manufactured with both the old and new HDC's, and since a common Service Manual was issued for those drives, that Service Manual, Cat No 26-4152, identified with MS2604155-584 on the rear cover applies to both HDC's. Since the manual also includes data sheets on the 5, 10, 12, and 15 Meg Tandon bubbles, and the difference between drives of different sizes is minor, that manual effectively covers the whole RS line. I recommend it as the one to obtain if possible. Availability is another matter; I don't know for sure if RS is still offering that manual for sale, but try for it if you want a general purpose manual to cover the RS boxes.

Other useful references include:

1. Radio Shack has a 62 page publication entitled "Radio Shack Hard Disk System Startup - TRS-80 Model 4/4P". Apparently it was part of the Model 4/4P DOS manual for hard disk systems. I found this manual to be helpful, although it assumes the use of the Radio Shack HD drivers. It also has a section on installing CP/M on a RS HD. It has the following two numbers on the rear cover:

TSA8749650
TAP8749531-8/84-BCo

2. If you use the MISOSYS hard disk drivers RSHARD5/6 with TRSDOS or LDOS, an instruction leaflet is included. While rather terse in style, the information is there. Very useful, comes with the driver software package from MISOSYS.

3. Radio Shack Service manuals for the various drives. Ask for the Service Manual for your hard drive by size in Megs and/or by the 26-xxxxx Catalog number from the bottom of the box.

The 5 Meg unit is Cat No. 26-1130. The Service Manual has No. 8749403 on its rear cover.

The 15 Meg unit is Cat No. 26-4155. The Service Manual has No. MS2604155-584 on its rear cover.

The 35 Meg unit is Cat No. 26-4171. The Service Manual has No. MS2604171-1084 on its rear cover.
-Roy T. Beck

SPECIAL CHARACTERS ON THE TRS-80

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Most of you are probably vaguely aware that your TRS-80 computer can display more characters on the screen than what you see on the keyboard. The Model I has a few extra symbols like a British pound sign built in; Models 3 and 4 have a whole set of special characters. The range for "normal" (or more technically speaking, USASCII characters) is from codes 32 to 127: when you type a "!" on the screen, you're actually sending a code 33 to the computer, which then displays an explanation mark. The Model 3 and 4 special characters range from codes 192-255. You also get a few special characters mapped to codes 0-31. (Codes 129-191 are all three models' block graphics characters). These special characters are shown in the back of the manual that came with your computer. They range from spades and hearts to Greek letters, math symbols, and even a smiling face.

Normally, you can't access these symbols, because the same codes that display them -- 192-255 -- are also used as space compression characters, and the space compression characters are the default when you turn on the computer.

There are actually not one but two sets of special characters built into your Model 3 or 4 computer. The second set is referred to as the "alternate special characters" in the manual, but it is never actually shown anywhere. On the Model 3 and black-and-white screen Model 4's, the alternate special characters are Japanese kana characters. On later Model 4's, they consist of a full set of Western European letters and diacritics, plus various miscellaneous symbols -- paragraph, micro, copyright, trademark, 1/2, 3/4, Yen, cents, etc. (Incidentally, if you have the Japanese characters but want the later character set, all that is involved is switching out the character generator chip on your motherboard).

If you have a Model 3 or 4 and want to see what the special characters actually look like, it is very easy to do so through BASIC.

Go into BASIC, then type

```
PRINT CHR$(21)
```

and press <ENTER>. Code 21 is the toggle between the space compression characters and the special characters. You've now toggled on the special characters. To see them, type in and run the following program:

```
10 FOR X=192 TO 255
20 PRINT CHR$(X);
30 NEXT X
```

Make sure you include the semi-colon in line 20. It will cause the characters to print across the screen rather than in a column down it. RUN the program: there are the special characters. To see the alternate special characters, there is another toggle. You activate it by typing

```
PRINT CHR$(22)
```

and pressing <ENTER>. The special characters on the screen will flip into different characters. To toggle them back, type PRINT CHR$(22) again.

At this point, you're probably asking yourself what the point of all this is. The special and alternate special characters may seem rather cute, but what good are they? Most TRS-80 programs make very little use of them. You occasionally see a copyright symbol, and Scripsit uses the paragraph symbol between paragraphs, but that's about it. These characters can, in fact, be very helpful and save you a lot of bother, if you ever want to print any of them.

As I mentioned in an earlier article, I teach German history at a small college in Texas. In my writing, I use a lot of letters with German umlauts over them. I also use quite a bit of other diacritics, usually with French words. Most word processors allow you to send any code you want to your printer, so that if a German double-S is code 225 (which it is in the IBM PC character set that most printers now support), you enter a special code sequence in your document which will cause a code "225" to be sent to the printer when the document is printed. With SuperScripsit, for example, the copyright symbol is used to send a predefined code (or sequence of codes) to the printer. If you are using a lot of special characters, though, seeing masses of codes embedded in your text makes proofreading almost impossible.

The word processors LeScript and Allwrite allow you to enter the actual characters. In both cases, you hit the <CLEAR> key and some other key (or combination of keys). If I want to print a word with a German double-S, I can actually display it on the screen, a real convenience. Character translation is handled somewhat differently by the two programs. A translation process is necessary because the TRS-80 special character set does not correspond to the character sequence in any current printer. The German double-S in the alternate special character set which I use with Allwrite is code 217, but it is code 225 my printer. So if I put the TRS-80 double-S in my document, it has to be switched from a 217 to a 225 at print time.

Allwrite handles translation of characters through a translation command which can be put in a file or through separate translation tables which are invoked at print time. The translation is one-for-one: a 225, for example, for a 217. LeScript is somewhat more flexible, for it allows you to define a symbol as not just one character, but a whole sequence of them. Say you want to print the Spanish letter "n" with a tilde (~) over it. If your printer has the letter and the tilde symbol, but not the two together, you would have problems with Allwrite; but with LeScript you could define the Spanish tilde-N, code 237 in the alternate special character set, as a normal "N" plus a backspace plus a tilde -- three codes in all. Allwrite, on the other hand, is probably more flexible in terms of invoking your translation sequence, for you can put it in your default file and then forget about it, while with LeScript you have to make sure your definition is at the beginning of each of your document files.

In either case, the TRS-80 can be a real convenience for anyone using foreign letters. Between the two character sets, you can actually display on your screen most any character you might want to type (unless you're into Cyrillic or Arabic alphabets!) and then, at least with Allwrite and LeScript, get that character to your printer. This is probably rather specialized for most

people, but often it is that specialized function that determines what computer you use -- and, not knowing it's possible to do it on your lowly TRS-80, you blow a bundle for a new system that you really didn't need in the first place.
-Gary Shanafelt

OPEN FORUM

LTR: Thank you for the fine work you are doing. I look forward to each issue of Computer News 80. Each issue renews that warm feeling of knowing that there remains a cadre of discerning individuals about the country who recognize the versatility and simplicity of their TRS-80 hardware and continue to put their computers to good use.

Over and over again I note the point being made in Computer News 80 that the reason for not converting from being a user of our faithful TRS-80 machines to MS-DOS is cost. Whether it is too costly to "transition (notice I do not use the inappropriate term "upgrade") to those MS-DOS behemoths for business or professional usage may not be the only issue. We need to make the point that where an end user must select the most efficient hardware and applications to accomplish a business or professional requirement while cost considerations should be a factor it is not the only determinant. Many such users in looking at the other available systems have made their decision to continue their TRS-80 usage based upon the judgment that what is available to us in the non TRS-80 arena is simply not an improvement on what we are presently using.

This is not stated because of ignorance of the capabilities of MS-DOS machines. Like Don Coffin, ;(Vol. 4 No. 7 page 4 - "Calling It Quits With Regrets) I too have MS-DOS machines which I use primarily for various graphics purposes. These MS-DOS machines are also used quite often for purposes of being a hardware bridge. They enable a quick transfer, via ASCII on MS-DOS formatted diskettes, of blocks of word processed material to other individuals. This is easily accomplished with PC-X-ZAP. The same application, PC-X:-XAP also transfers their blocks of MS-DOS ASCII saved word processed material to an LS-DOS diskette and then into Scripsit-Pro for my use.

For Don Coffin and others who ruefully watch their faithful TRS-80 machines "age" and fear their demise without replacement they there are perfectly good and often minimally used TRS-80s found offered for sale "second hand" - and at a reasonable prices - in the classified ads of newspapers and elsewhere. [And in CN80] This source of TRS-80 hardware can extend the useful life of their TRS-80 computing for decades! I have done just that. I now have two "spare" Model 4P's and 5 meg hard drives for just that reason stored in the closet. If the good Lord is willing, I hope to use them past the year 2000.
- J. H. MD, University of Florida, Gainesville, FL

A: We couldn't agree with you more. -CN80

LTR: This letter is a reply to Henry Blumenthal concerning my review of FASTBACK/ FASTREST by David Goben.

From Henry Blumenthal:
Henry's comment-"you did not report that you have extended memory which FASTBACK looks for and utilizes. Therefore, readers who do not have the amount of RAM that you do -- and that's probably most of use -- may not see results that even approach what you reported. Therefore I suggest that you might have pointed out that Fastback's best feature is that it makes memory available. I, for one, would like to know how it would compare with ARCHIVE and RESTORE that came with MISOSYS' hard drive when only 128k is available."

My reply follows:

"Your point was well taken about using extended memory with FASTBACK and FASTREST as I did invoke HYPERBNK before backing up my hard drive partitions. Using my 512K extended memory, I had 15, 32K banks available to FASTREST to read into before copying to the floppy backup disk. With the 128K memory you have, you have 3, 32K banks available. This is not too shabby anyway as I conducted the following FASTBACKup without invoking HYPERBNK.

Backing up the 0 drive to my 3 1/2in. floppies, I had the following times:
Drive 0 = 7 disks 11.5min.
Free Space 524K/4896
Drive 1 = 7 disks 12.75min
Free Space 236K/4896
Drive 2 = 4 disks 7.0min.
Free Space 256K/2448
Drive 3 = 3 disks 5.5min.
Free Space 408K/2448

If you go back to my review times, see page 32 of Vol 4. No. 7 of CN80, you'll see it's not too far off from those times. Notice that I had added info to my 0 drive and as a result it required 7 disks, where in the article I only had 6 disks. Also the Free Space is decreasing as I add more to my drives. However, the times are still very close.

What is happening, is that without the extra memory, the program must read into memory more often, and you would see the phrase "Reading hard disk..." more often. But with a hard drive this reading, and if the files are contiguous, will be read very rapidly and the phrase is on the screen only momentarily. With 5 1/4in. disks, the time will still only be slightly more.

As far as using ARCHIVE, that came with your hard drive package, I have the ARCHIVE6 that came with RSHARD from Misosys also and I believe they would be very similar. ARCHIVE6 was a "bore" as it took so long and if you re-read my review, see the "EXAMPLES OF TIME INVOLVED" section where I entered my comments about ARCHIVE".

My additional comment would be that David Goben has utilized memory here so well, that even without vast amounts of extended memory, those Model 4 hard drive owners that have 128K can still utilize an extremely well written and thought out utility that is heads above the crowd! $29.95 + $2 shipping. The word is out
---BACKUP--BACKUP!
-Bill Newman

Addition to the Hi-Resolution Catalog

MDRAW II VOLUME # M4HRZ23

Scott McBurney's MDRAW with various revisions and enhancements, with documentation by Gary Shanafelt

Scott McBurney first wrote this program as a basic drawing utility for his Model 4 hi-resolution board. He called it DRAW/BAS. Though he said it was simply a stopgap for MicroLabs' Pro-Draw, which he couldn't afford, it became part of everyone's hi-res library because it included a routine to print Dotwriter letters on the screen. It had something no other program had. George Madison liked it so much, in fact, that he rewrote the Dotwriter routines and ported them over to TRSDRAW/BAS, another hi-res drawing program. Then, a few years later, Scott wrote a revised version called MDRAW/BAS. It was basically DRAW but with the addition of a driver to support a Microsoft serial mouse: hence the "M" in the name, for "mouse." This was again a first -- no other TRS-80 program would work with a serial mouse. And when the MicroLabs mouse hardware interface was sold out, MDRAW/BAS became the ONLY way to use a mouse with the hi-res board.

In the last few months, a number of TRS-80 mouse drivers have become available, all using the same interface for the Model 4. They were inspired by (you guessed it) the original mouse driver that Scott wrote for MDRAW. It thus seems like the time to upgrade MDRAW to work with them. David Goben rewrote the interfacing to work with the new mouse standard; yours truly worked over much of the rest of the code, adding or changing various features. Finally, to enable the program to use both the normal /HR format hi-res files and the compressed /CHR format, the program now utilizes two utilities written by Mel Patrick (with minor modification by Gary Shanafelt). This really has been something of a cooperative effort, but it all happened because Scott McBurney wrote such an original series of programs to start with. Despite all the changes, MDRAW II is still Scott's program.
-Gary Shanafelt

What Is It?

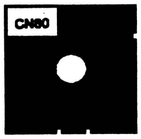
A CN80 Staff Report

Because so many are picking up computers now from the used market, we thought that a list of catalog numbers would be helpful in identifying what computer you have or may have the opportunity to purchase.

Cat. Number -	Year -	Description
26-1051	1979	Model I Level I 4K
26-1053	1979	Model I Level I 16K
26-1054	1979	Model I Level II 4K
26-1056	1979	Model I Level II 16K Cassette based separate Video Display 16 lines of 32 characters.
26-1059	1984	Model 4 Student Station requires Network 2 Controller and Model III or 4 host computer.
26-1061	1981	Model III, Level I Bas.4K
26-1062	1981	Model III, Mod III Bas. 16K Cassette based.
26-1063	1981	Model III 2-disk 5-1/4" 32K
26-1065	1982	Model III 1-disk 5-1/4" 48K without RS232 Comm. Board
26-1066	1982	Model III 2-disk 5-1/4" 48K with RS232 Comm. Board
26-1067	1983	Model 4, Cassette Based 16K
26-1068	1983	Model 4, 1-disk 5-1/4" 64K without RS232 Comm. Board
26-1069	1983	Model 4, 2-disk 5-1/4" 64K with RS232 Comm. Board
26-1070	1986	Model 4D 2-disk same as Model 4, except with double-side drives installed 64K
26-1080	1983	Model 4P, Portable 64K
26-1084	1984	Model 4P, Modem Board
26-3001	1981	Color Computer (CoCo) 4K
26-3002	1982	Color Computer 16K Ext.Bs.
26-3003	1982	Color Computer 32K Ext.Bs.
26-3003	1983	Color Comp. 64K Ext. Basic
26-3004	1983	Color Computer 16K Std.Bs.
26-3127	1985	Color Comp. 64K Ext. Basic
26-3013	1983	Micro Color Comp. 4K Ram
26-3026	1983	Color 2, 16K Standard Basic
26-3027	1983	Color 2, 16K Extended Basic
26-3134	1985	Color 2, 16K Standard Basic
26-3136	1985	Color 2, 16K Extended Basic
26-3501	1981	Pocket Computer 1.7K RAM
26-3590	1983	PC-3 Pocket Computer 1K
26-3601	1983	Pocket Computer 1.9K RAM
26-3650	1983	PC-4 Pocket Computer 1K
26-3801	1984	Model 100, Laptop 8K
26-3802	1984	Model 100, Laptop 24K
26-3803	1987	Model 102, Laptop 24K
26-3860	1985	Model 200, Laptop 24K
26-4001	1979	Model II, 1-disk 8" 32K
26-4002	1979	Model II, 1-disk 8" 64K
26-4004	1983	Model 12, 1-disk 8" 80K
26-4005	1983	Model 12, 2-disk 8" 80K
26-5103	1984	Model 2000, 2-disk 5" 128K
26-5104	1984	Model 2000, 1-disk 10megHD
26-6001	1982	Model 16, 1-disk 8" 128K
26-6002	1982	Model 16, 2-disk 8" 128K
26-6004	1983	Model 16B, 1-disk 8" 256K
26-6005	1983	Model 16B, 2-disk 8" 256K
26-6006	1983	Model 16B,1-disk 15meg HD
26-6050	1982	Data Terminal Mod 16 LAN
25-1000	1984	Tandy 1000 80% IBM Clone and Tandy's beginning model which moved them into the IBM/MS-Dos arena, and when they began to desert the TRS-80 computers.

We hope that this table will assist you in identifying your computer or one that you may purchase from a school sale or other source. We did not carry the color computers all the way through to the Color III because we felt that if you are a CoCo buff that you should already be familiar with them and they were in the Tandy catalogs from 1987 on, until they were also discontinued in 1991.

Many changes were made to the internal components of these computers as they were produced, which means that not all computer motherboards, etc. are the same even though the computers may have the same catalog number. But generally speaking the disk drive controller is the same for all computers. The disk drives only differ in that they may be single-sided drives, or double-sided drives. With the exception that some of the earlier disk drive controller boards had edgecard connectors from the board to the drives and the later models had a 34 pin type connector.



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- **DSP**, to display control codes and graphics characters;
- **MAPMEM**, to list all low and high memory modules;
- **MOVE**, to transfer files from one drive to another;
- **PRINT**, to format and print text files;
- **PRT**, to print control codes and graphics characters;
- **RECLAIM**, to remove unused high memory modules;
- **SETMOD**, to set or reset files' MOD flags;
- **SETVIS**, to make files visible or invisible;
- **SWAP**, to exchange disk drive numbers;
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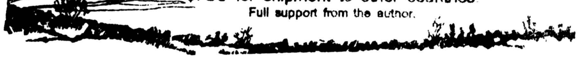

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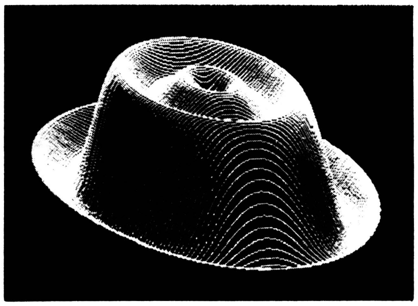

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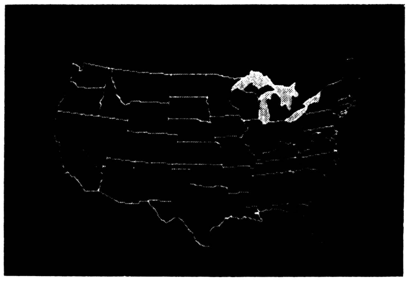

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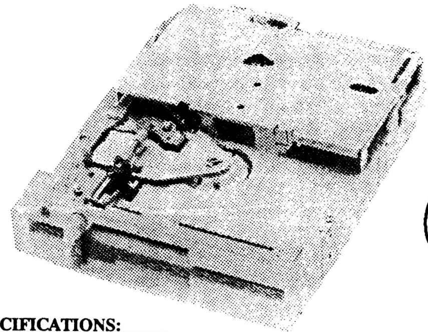

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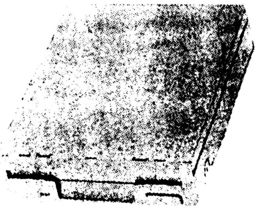

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LDOS 5.3.1: the support continues

- The DATE command, "Date?" prompt on boot, and the @DATE SVC now support a date range of 32 years; from **January 1, 1980 through December 31, 2011;** time-stamping, too.
- **Double-density BOOT support for Model I** with embedded SOLE and FORMAT (SYSTEM). Supports mirror-image backup, too. Reworked FDUBL driver eliminates PDUBL and RDUBL and takes less memory; enhanced resident driver eliminates TWOSIDE.
- Model III version auto-detects Model 4 for installation of KI4 keyboard driver; supports CAPS, CTRL, and function keys.
- SYSTEM command supports removable and reusable BLINK, ALIVE, and UPDATE memory modules.
- The TED text editor now has commands to **print the entire text buffer**, or the contents of the first block encountered. Obtain directories from TED, too!
- The SPOOL command offers Pause, Resume, and Clear parameters. (OFF) attempts to reclaim memory used.
- **Alter the logical record length** of a file with "RESET filespec (LRL=n)"
- Specify "RESET filespec (DATE=OFF)" to restore a file's directory entry to the old-style dating of pre-5.3 release. Specify "RESET filespec (DATE=ON)" to establish a file's directory date as that of the **current system date and time.**
- Both Model I and Model III support similar commands: all features of Model III 5.3.0 are in Model I 5.3.1. That includes such facilities as DOS and BASIC help files, SETCOM and FORMS library commands, TED text editor, BASIC enhancements, etc. All DOS commands have been groomed for Model 4 LS-DOS 6.3.1 syntax where possible.
- Best of all, **a 5.3.1 diskette is available as a replacement for your 5.3.0 diskette for $15** (plus $3 S&H in US and Canada, $4 elsewhere). There's no need to return your current master.
- The 5.3.1 diskette(s) come(s) with a 30-day warranty; written customer support is available for 30 days from the purchase date. Versions for the Model I and Model III are available. **If you do not already have an LDOS 5.3.0, order the 5.3.1 Upgrade Kit with 30 days of customer support for $39.95** (+$4 S&H). Some features require lower case or DDEN adaptor.

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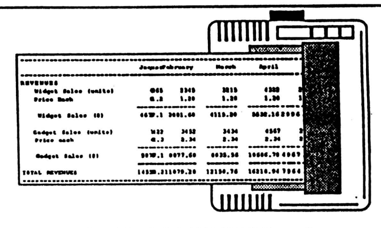

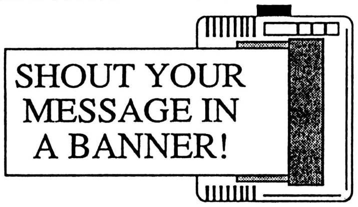

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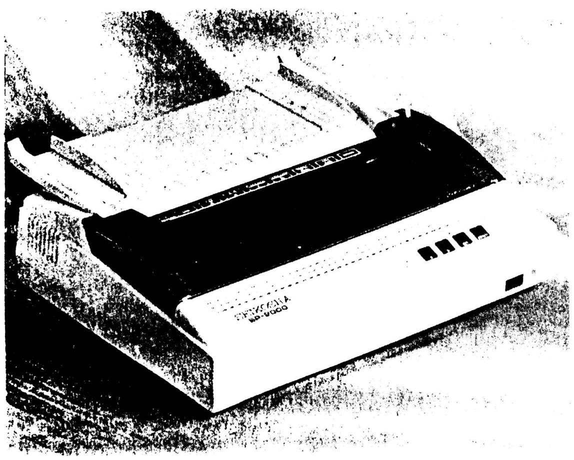

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Monte's Hardback is a utility for backing up your hard drive under CP/M and has the ability to to restore single files from a backup set.

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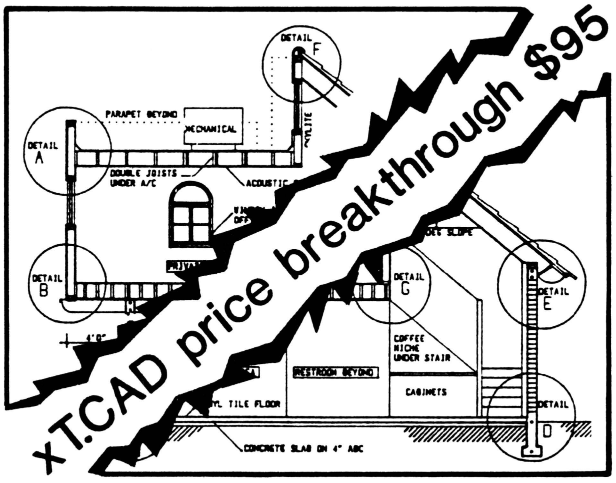

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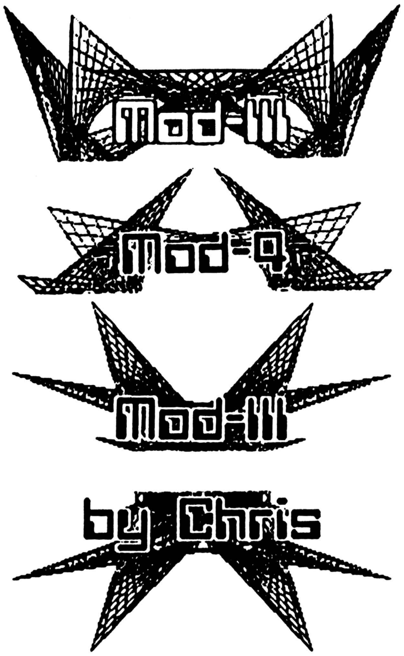

Books by Christopher Fara

MOD-4 by CHRIS	for TRS/LS-DOS 6.3, 232 pages	each $24.95
MOD-III by CHRIS	for LDOS 5.3, 234 pages	any two $39.95
MOD-III by CHRIS	for TRSDOS 1.3, 210 pages	any three $59.95

Complete Owner's Manuals for Models 4/4P/4D and Model III, fully updated for all current DOS versions. These beautifully designed books replace obsolete and confusing Tandy and LDOS manuals and addenda. Mod-III editions combine both the "Basic Operations" and "Disk System" manuals in one book. Mod-4 edition has chapters on DOS SuperVisor Calls, previously not accessible without a separate "technical" manual. And no more fumbling between pages: each subject is contained under a logical, bold heading on one page or on pages facing each other, with plenty of blank spaces for notes.

Written in plain English, the manuals are better organized, with more and better examples for the use of DOS, JCL and BASIC; include chapters with examples on interfacing of DOS and BASIC with assembly language; describe in detail popular ROM, RAM and DOS subroutines; and provide lots of useful extra information never before published in the Model III and Model 4 manuals.

"... no matter how long one is using a system, there will be times to look up the manual ... nothing easier than looking into Chris' comprehensive, beautifully arranged and printed treatise ... the organization is exceptional good ..." (review by Henry H. Herrdegen)

"... excellent alternative ... not only does it offer information I have not been able to find in the regular BASIC manuals, it explains in better detail what some of the more arcane commands are good for, or not good for ... here is a manual where you can find it all ..." (review by Henry A. Blumenthal)

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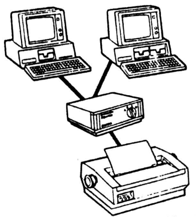

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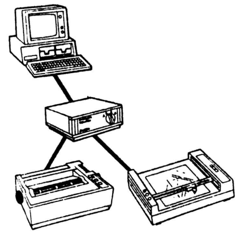

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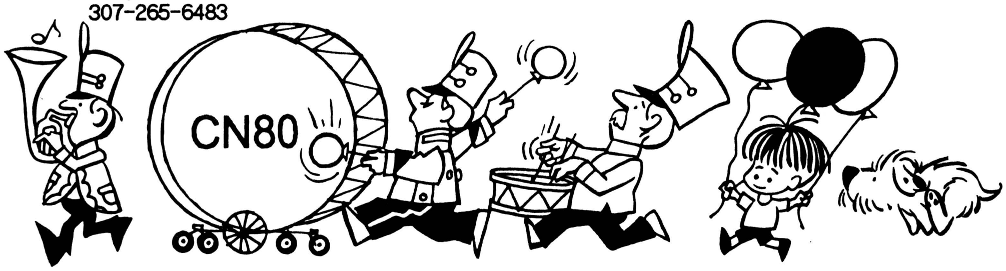

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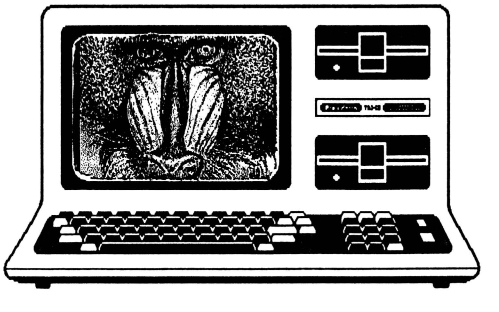

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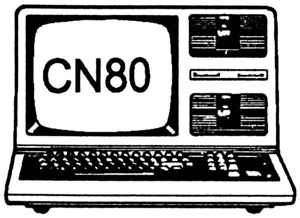

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